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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/539,661	06/14/2005	Ulrich Lages	7395-00028/NP	6648

27572   7590   03/28/2008
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EXAMINER
FUJITA, KATRINA R

ART UNIT	PAPER NUMBER
2624	

MAIL DATE	DELIVERY MODE
03/28/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

		Application No.	Applicant(s)
Office Action Summary		10/539,661	LAGES ET AL.
		Examiner	Art Unit	
		KATRINA FUJITA	2624	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS,
WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _14 June 2005_.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _29-56_ is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _29-56_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _14 June 2005_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☒ All b)☐ Some * c)☐ None of:

   1.☒ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
   application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO/SB/08)
     Paper No(s)/Mail Date _06/14/2005, 03/07/2006_.

4)☐ Interview Summary (PTO-413)
     Paper No(s)/Mail Date. _____

5)☐ Notice of Informal Patent Application

6)☐ Other: _____

DETAILED ACTION

Priority

1.   Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which

papers have been placed of record in the file.

Claim Rejections - 35 USC § 101

2.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and

the rest of the computer which permit the computer program's functionality to be realized, and is thus
statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

3.   Claims 54 and 55 are rejected under 35 U.S.C. 101 because the claimed

invention is directed to non-statutory subject matter as follows. Claim 54 defines a

computer program embodying functional descriptive material. Claim 55 defines a

computer program product embodying functional descriptive material. However, the

claims does not define a computer-readable medium or computer-readable memory and

is thus non-statutory for that reason (i.e., "When functional descriptive material is

recorded on some computer-readable medium it becomes structurally and functionally

interrelated to the medium and will be statutory in most cases since use of technology

permits the function of the descriptive material to be realized" – Guidelines Annex IV).

The scope of the presently claimed invention encompasses products that are not

necessarily computer readable, and thus NOT able to impart any functionality of the

recited program. The examiner suggests amending the claim(s) to embody the program

on "computer-readable medium" or equivalent; assuming the specification does NOT

define the computer readable medium as a "signal", "carrier wave", or "transmission

medium" which are deemed non-statutory (refer to "note" below). Any amendment to

the claim should be commensurate with its corresponding disclosure.

Note:

       A "signal" (or equivalent) embodying functional descriptive material is neither a

process nor a product (i.e., a tangible "thing") and therefore does not fall within one of

the four statutory classes of § 101. Rather, "signal" is a form of energy, in the absence

of any physical structure or tangible material.

Should the full scope of the claim as properly read in light of the disclosure

encompass non-statutory subject matter such as a "signal", the claim as a whole would

be non-statutory. In the case where the specification defines the computer readable

medium or memory as statutory tangible products such as a hard drive, ROM, RAM,

etc, as well as a non-statutory entity such as a "signal", "carrier wave", or "transmission

medium", the examiner suggests amending the claim to *include* the disclosed tangible

computer readable media, while at the same time *excluding* the intangible media such

as signals, carrier waves, etc.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5.   Claims 29-56 are rejected under 35 U.S.C. 102(b) as being anticipated by Ewald

et al. ("Laser Scanners for Obstacle Detection...", IEEE Article).

Regarding **claims 29 and 54-56**, Ewald et al. discloses a method, computer

program, computer program product ("software: Object tracking" on page 684, left

column, line 1) and apparatus (figure 3) for the recognition and tracking of objects

("matching allows tracking the same objects" at page 684, section 2.3, line 3) with at

least one optoelectronic sensor, in particular a laser scanner (figure 3), the viewing

range of which includes the detection range (figure 2) and

a data processing device associated with the optoelectronic sensor ("digital

signal processor" at page 683, section 1.3, paragraph 2, line 2), said data processing

device being designed to carry out a method for the recognition and tracking of objects

on the basis of images of at least one real object ("objects" at page 684, section 2.1,

paragraph 2, line 1) including depth resolved image points (figure 5) detected in time

sequence by at least one sensor for an electromagnetic radiation ("reflections from the

target are then measured by the receiver. The distance to the target is directly

proportional to the time between transmission and reception of a laser pulse" at page

683, section 1.2, line 5), in particular a laser scanner, with the real object being in a

detection range of the sensor ("obstacles which lie within the detection area of the

scanners" at page 684, section 2.1, paragraph 4, line 1), in which the following steps are

carried out in sequential cycles:

at least one current object contour is formed from image points of a current

image (figure 5 shows object contours as indicated by the straight lines),

for objects in a preceding cycle at least one object contour is predicted in the

current cycle starting in each case from an object contour associated with the respective

object in the preceding cycle ("objects tracked in previous scans are run through a

Kalman filter to estimate their position in the current scan" at page 685, section 2.4,

paragraph 1, line 1),

for at least one of the objects a current position is determined from the current

object contour and/or an object speed is determined from the current object contour and

the object contour in a preceding cycle ("The state of the object is then updated in the

segment to generate new dynamic parameters like velocity and acceleration" at page

685, section 2.4, paragraph 1, line 7).

Regarding **claim 30**, Ewald et al. discloses a method characterized in that

for the formation of current object contours segments are formed from image

points of a current image ("clusters, called 'segments'" at page 684, section 2.1,

paragraph 2, line 3);

in that for each of the segments a segment contour associated with the segment

and its position are determined ("bounding box for each segment" at page 684, section

2.2, second to last line);

in that one of the segment contours is compared with at least one of the

predicted object contours with reference to the position and/or the shape and in

dependence of the result of a comparison the segment corresponding to the segment

contour is associated with one of the objects and in that current object contours are

respectively formed from the segments respectively associated with the segment

contours of objects (first bullet point, section 2.2).

Regarding **claim 31**, Ewald et al. discloses a method in that contours are defined

by a contour element or by a sequence of contour elements ("bounding box for each

segment" at page 684, section 2.2, second to last line) and in that the contour element
or data defining the contour elements are determined from at least one image point of a
segment or contour elements of another contour ("list of segments which contains
information like position, size, number of scanpoints" at section 2.2, last paragraph, line
1).

Regarding **claim 32**, Ewald et al. discloses a method characterized in that the
contour elements respectively include position coordinates as data ("list of segments
which contains information like position" at section 2.2, last paragraph, line 1).

Regarding **claim 33**, Ewald et al. discloses a method characterized in that for the
formation of a contour element of a segment contour a predetermined number (the
predicted contour is limited by the size of the object it is being compared to as the object
is made of a certain amount of points, which is predetermined to construction of the new
contour) of sequential image points of the segment with polar angles which increase or
reduce in a series (figure 5; objects 13 or 15, for example, arose due to sequential
points that are varying with polar angle) with respect to a predetermined polar axis (the
polar axis is predetermined at the origin of the scanning area as shown in figure 2) are
associated with a corresponding contour element and in that data of the contour
element is determined from the image point.

Regarding **claim 34**, Ewald et al. discloses a method characterized in that for the
formation of a contour element of a segment contour respective sequential image points
(figure 5; objects 13 or 15, for example, arose due to sequential points that are varying
with polar angle) of the segment in a series of increasing or decreasing polar angle with

respect to a predetermined polar axis (the polar axis is predetermined at the origin of

the scanning area as shown in figure 2) are associated with a corresponding contour

element the spacing of which from a first image point associated with the contour

element is smaller than a predetermined maximum spacing and in that data of the

contour element are determined from these image points (figure 6; "segmentation

threshold d1" at page 685, section 2.5, paragraph 2, line 13).

Regarding **claim 35**, Ewald et al. discloses a method characterized in that

contour elements are obtained by vectorization of a curve which arises by connecting

the image points of a segment in a series of increasing or decreasing polar angle (figure

5; objects 13 or 15, for example, arose due to points that are varying with polar angle)

with reference to a predetermined polar axis (the polar axis is predetermined at the

origin of the scanning area as shown in figure 2).

Regarding **claim 36**, Ewald et al. discloses a method characterized in that the

positions of the image of a segment are subjected to low pass filtering prior to the

formation of the contour elements ("objects tracked in the previous scans are run

through a Kalman filter to estimate their position in the current scan" at page 685,

section 2.4, line 1).

Regarding **claim 37**, Ewald et al. discloses a method characterized in that a

quality is associated with at least one contour element which depends on the position of

the image points used for the determination of the contour element ("best-matching

segment for each object is calculated" at page 685, section 2.4, line 3).

Regarding **claim 38**, Ewald et al. discloses a method characterized in that, for

the prediction of the position of an object contour in a current cycle, an object speed

determined in a preceding cycle is used ("velocity and acceleration are calculated. A

Kalman filter is used to predict object movement and thereby further enhance the

detection quality" at page 684, section 2.1, paragraph 2, line 8).

Regarding **claim 39**, Ewald et al. discloses a method characterized in that

a capture region is associated with each object (the capture region is defined by

areas around the object within the "segmentation threshold d1" at page 685, section 2.5,

paragraph 2, line 13) and in that a segment contour of a segment is only compared with

an object contour of an object in the capture region of which at least one reference point

of the respective segment lies ("computing a "distance" between each object and

segment, taking into account both the position and the size of segments and objects" at

page 685, section 2.4, line 4).

Regarding **claim 40**, Ewald et al. discloses a method characterized in that,

for the comparison of a segment contour with an object contour, an association

quality is determined for a segment and an object which is a measure for the agreement

of the respective contours with respect to position and/or shape and in that a segment

which can be associated with two objects is associated with that object for which it has

the best value of the association quality ("best-matching segment for each object is

calculated. This is done by computing a "distance" between each object and segment,

taking into account both the position and the size of segments and objects" at page 685,

section 2.4, line 3).

Regarding **claim 41**, Ewald et al. discloses a method characterized in that,

for the comparison of a segment contour with an object contour, an association quality is determined for a segment and an object which is a measure for the agreement of the respective contours with respect to position and/or shape and in that a segment which can be associated with two objects is associated with that object for which it has the best value of the association quality ("best-matching segment for each object is calculated. This is done by computing a "distance" between each object and segment, taking into account both the position and the size of segments and objects" at page 685, section 2.4, line 3);

and in that from pairs respectively consisting of a contour element of the segment contour and a contour element of the object contour, differences are determined between corresponding data of the contour elements and in that the association quality is determined using the differences (figure 6).

Regarding **claim 42**, Ewald et al. discloses a method characterized in that,

for the comparison of a segment contour with an object contour, an association quality is determined for a segment and an object which is a measure for the agreement of the respective contours with respect to position and/or shape and in that a segment which can be associated with two objects is associated with that object for which it has the best value of the association quality ("best-matching segment for each object is calculated. This is done by computing a "distance" between each object and segment, taking into account both the position and the size of segments and objects" at page 685, section 2.4, line 3);

and in that pairs respectively consisting of a contour element of the segment

contour and a contour element of the object contour are determined among the contour

elements of the segment contour and the contour elements of the object contour which

at most differ in one item of the data by a predetermined amount and in that the number

of these pairs is determined for the determination of the association quality ("generate

new dynamic parameters like velocity and acceleration, and set the new size. The

Kalman filter will reject the assigned segment if the deviation is too high" at page 685,

section 2.4, line 8).

Regarding **claim 43**, Ewald et al. discloses a method characterized in that,

for the comparison of a segment contour with an object contour, an association

quality is determined for a segment and an object which is a measure for the agreement

of the respective contours with respect to position and/or shape and in that a segment

which can be associated with two objects is associated with that object for which it has

the best value of the association quality ("best-matching segment for each object is

calculated. This is done by computing a "distance" between each object and segment,

taking into account both the position and the size of segments and objects" at page 685,

section 2.4, line 3);

and in that pairs respectively consisting of a contour element of the segment

contour and a contour element of the object contour are determined among the contour

elements of the segment contour and contour elements of the object contour for which

position coordinates have a spacing which is smaller than a predetermined maximum

pair spacing and in that the number of these pairs is determined for the determination of

the association quality (figure 6; "segmentation threshold d1" at page 685, section 2.5, paragraph 2, line 13).

Regarding **claim 44**, Ewald et al. discloses a method characterized in that,

for the comparison of a segment contour with an object contour, an association quality is determined for a segment and an object which is a measure for the agreement of the respective contours with respect to position and/or shape and in that a segment which can be associated with two objects is associated with that object for which it has the best value of the association quality ("best-matching segment for each object is calculated. This is done by computing a "distance" between each object and segment, taking into account both the position and the size of segments and objects" at page 685, section 2.4, line 3);

and in that for the determination of the association quality a contour element of the segment contour and a contour element of the object contour are determined for which the position coordinates have the smallest spacing among all pairs of contour elements of the segment contour and contour elements of the object contour (the best match is determined by a distance between the previous scan data and the current scan data. as such, the closest, best match would be one that is minimized in deviation from the previous data, or having the "smallest spacing").

Regarding **claim 45**, Ewald et al. discloses a method characterized in that

two or more segments are only then associated with an object when a spacing of the segments from the object is respectively smaller than a predetermined maximum spacing (figure 6).

Regarding **claim 46**, Ewald et al. discloses a method characterized in that a hiding recognition is executed during the association of segments to objects (page 685, section 2.4, paragraph 3).

Regarding **claim 47**, Ewald et al. discloses a method characterized in that when recognizing at least two segments which can be associated with the same object, but which should not both be associated with the same object, the segment with the better association quality is associated with the object (page 685, section 2.5, paragraph 2).

Regarding **claim 48**, Ewald et al. discloses a method characterized in that for the determination of the object speed a difference is determined between the position and/or the orientation of the current object contour and the position and/or orientation of the object contour in the preceding cycle or the predicted object contour ("The state of the object is then updated in the Kalman filter with the new information of the segment to generate new dynamic parameters like velocity and acceleration" at page 685, section 2.4, line 7).

Regarding **claim 49**, Ewald et al. discloses a method characterized in that in the determination of the difference between the position and/or orientation of the object in the current cycle and the position and/or orientation of the object contour in the preceding cycle, or the predicted object contour, contour elements of the current object contour and contour elements of the object contour in the preceding cycle or of the predicted contour are associated with one another and in that the change of the position and/or orientation of the object contour in the preceding cycle to that in the

current cycle is determined from those contour elements of the current contour which
are associated with contour elements of the object contour in the preceding cycle or of
the predicted object contour (page 685, section 2.4, paragraph 1).

Regarding **claim 50**, Ewald et al. discloses a method characterized in that

for the association of contour elements of two object contours relative to one
another, starting from contour elements of the object contours with position coordinates
which respectively correspond to one end of the contour, a search is in each case
made, for sequential contour elements along one of the two contours, for a
corresponding not yet associated contour element of the other contour of which the
position coordinates have a minimum spacing from the position coordinates of the
contour element of the one contour (page 685, section 2.5, paragraph 2; figure 6).

Regarding **claim 51**, Ewald et al. discloses a method characterized in that in
each case at least one reference element is determined for an object contour; in that,
for the association of object elements (38) of the predicted contour and object elements
of the current object contour, a correction shift is found between the reference elements
of the predicted contour and the current contour and in that the association of contour
elements of the predicted contour to contour elements of the current contour takes
place using the contour elements of the predicted contour shifted by the correction shift
of the reference elements (page 685, section 2.4, paragraph 1).

Regarding **claim 52**, Ewald et al. discloses a method characterized in that

differences between the position coordinates of mutually associated contour
elements of the current contour and of the contour determined in the preceding cycle or

of the predicted contour are first determined; in that a translation and/or a rotation of the object between the preceding cycle and the current cycle is determined from these differences and in that the object speed is determined on the basis of this translation and/or rotation (page 685, section 2.4, paragraph 1).

Regarding **claim 53**, Ewald et al. discloses a method characterized in that

the object speeds are subjected to a low pass filtering operation ("updated in the Kalman filter with the new information of the segment to generate new dynamic parameters like velocity and acceleration" at page 685, section 2.4, line 7).

Conclusion

6.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATRINA FUJITA whose telephone number is (571)270-1574. The examiner can normally be reached on M-Th 8-5:30pm, F 8-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571) 272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Katrina Fujita/
Examiner, Art Unit 2624

/Vikkram Bali/
Supervisory Patent Examiner, Art Unit 2624